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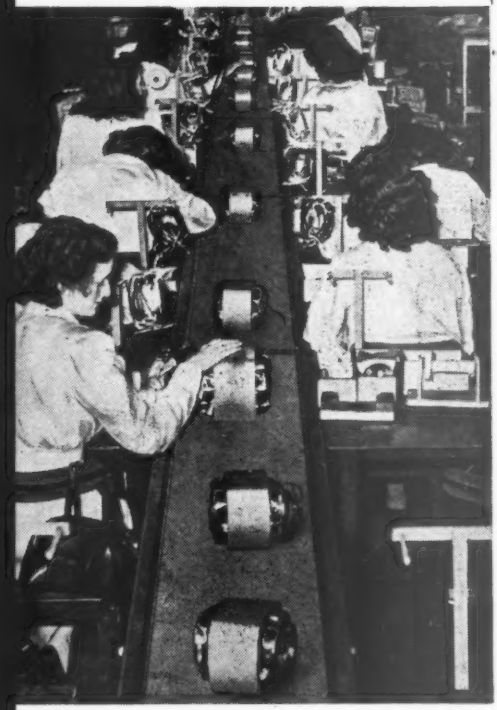

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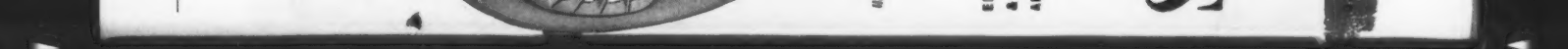

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THE ENGINEERING OF PRODUCTION

The Council Meeting of January, 1950, was of considerable significance in the Institution's history since it opened a year when two most important developments are to mature. The first is the inauguration of the Associate Membership examination, the details of which have been well publicised, and the second is the inauguration of the Schofield Travel Scholarship, in connection with which there have not only been regular announcements in the Journal, but in the March Journal there was a report from the Committee on the whole procedure of selection and so on.

It is the duty of Council and its committees to take every proper step to carry out the objects for which the Institution was formed, and it may be well from time to time to look back and consider progress.

Statistics as to the growth of an organisation may or may not be impressive depending on the point of view—but in our case it is impressive to see the membership lists for 1939 and 1945 and to see that whereas the first was contained in a pretty thin volume, the latter is of normal book thickness, and when the next one is prepared, it will be essential to do much condensing if the whole is to come between two covers only.

It is important too, to note that in this spectacular growth there has been a great intake of Graduates with that academic and practical background which will inevitably require that they fill, eventually, the highest posts of responsibility in industry.

The Institution draws strength in part from the status which it confers, and in part from the opportunity it is able to create for members to help each other, and their fellows generally.

Obviously status is of the greatest importance to the young. It is a purpose of our Institution to see that the younger men in industry, who are equipping themselves for the responsibilities and obligations of important posts in future production, are given a measure by which they may not only determine their own progress, but declare it to the world. The Graduate examination which has been in being for many years, has contributed immensely to this end, and it is believed that our Graduates may well be proud at once of their own achievement, and the Institution to which they belong. And, of course, behind the Graduate is all the help

and encouragement which the Institution is continually trying to give to the student.

The success of the Institution's policies over the years has been a source of real satisfaction, and there can be no doubt that the two developments mentioned above will be of great additional value to its members.

When we come to the body of members and associate members, the need for a yardstick of status is not so obvious, for in the majority of cases, such members will have a personal record on the job which gives all the evidence required. It is true too that many of these members have come in through the Graduate gate. However that may be, no man can be true to his profession if he has merely equipped himself. He must accept responsibilities for two things in particular. One is the training of those who follow on and the other is the establishment and development of a proper code of conduct so that it may strive to serve its day and generation and not merely to exploit it.

This is the special task of age and experience: it is the task which requires the widest possible basis of objective wisdom with the utmost regard to principle.

Here again the Institution may be proud of its record. Its members collectively and severally have made immense contributions to industry outside what was perhaps their own particular field, sometimes on the basis of acquaintanceship arising from a common membership, but more often between complete strangers united by a common object.

So often has this been the case too during the war and the period of national difficulties. It may proudly be boasted that as the Institution was born out of the demonstrated need in the First World War, never has that need since been expressed without a ready response from the Institution and its members. It must remain a permanent understanding that members and the Institution will willingly lend their aid to any proper approach for help and advice. But while all this may be taken for granted, there remains the field of influence.

It has from earliest days been the Institution's policy to admit to its ranks those who " Engineer Production " in its widest sense. It has always maintained the fundamental technical requirement that the candidate must basically have engineering training. In brief, it was designed for any man with the necessary background and status who is really applying the principles of Engineering to Production.

Emerson said that " if a man write a better book, preach a better sermon, or make a better mouse trap than his neighbours, though he build his house in the woods, the world will make a beaten path to his door." The Institution in like manner accepts into

membership those who apply the principles of Engineering to the production of such better things.

Through the years many such men have become members and the Institution is the stronger because of them. What Council has exposed in its discussions is the question of how far is this aspect appreciated by the main body of members, especially since there is no regular re-statement of policies and so on.

The Institution is in a position of great influence, and it covers a wide field of industry. It is however, thin in parts and if the Institution is to fulfil its true destiny, it must be sure that it is known that its doors are open to all those united in this Common Purpose.

Aristotle says that "Happiness consists in a life of activity devoted to worthwhile ends."

The objects of the Institution are worthwhile ends to any Engineer, engaged in any production.

J. E. HILL,

Chairman of Council.

INSTITUTION NOTES

May, 1950

MECHANICAL HANDLING EXHIBITION, OLYMPIA

Through the generosity of the proprietors of the journal " Mechanical Handling," the Institution will have its own stand at the Mechanical Handling Exhibition which is being held at Olympia from June 6th-June 17th, 1950. This Exhibition is the largest of its kind ever to be held.

A Convention will run throughout the Exhibition, at which papers by leading authorities will be read. Mr. Walter C. Puckey, Vice-Chairman of Council, has been invited to contribute to this series on June 7th, when he will give a paper entitled, " Materials Handling— The Job of the Production Engineer." The Chairman on this occasion will be Dr. Herbert Schofield, C.B.E., President of the Institution.

On June 10th, another member of the Institution, Mr. W. J. Webb, will give a paper on " Method, Motion, Time and Materials Handling." Mr. H. W. Bowen, O.B.E., will take the Chair for this discussion.

The Institution's stand will be in the Grand Hall Annexe (Stand No. c.7). Available for reference on the stand will be a large number of the most recent books and publications dealing with all aspects of Mechanical Handling. These works have been gathered from a variety of sources and will include many American publications. The Institution is preparing a printed Bibliography of publications on Mechanical Handling which will be distributed free to all visitors to the Stand. Secretarial and telephone facilities will be available to members visiting the Stand, a part of which will be fitted as a lounge for the comfort and convenience of members and friends.

CONFERENCES ON MATERIAL HANDLING Two One-Day Conferences on Material Handling are to be held this month. The first, on May 13th, has been arranged by the Western Section, and will be held in Bristol. Invitations have been issued to all members of the Institution in the South Western Area.

The second Conference, which has been organised by the Coventry Section, will be held on May 20th at the Stoke and Ryton Factories of Humber, Ltd.

CHANGE OF DESIGNATION At the Annual General Meeting held in January last, the designatory letters " I.Prod.E." were adopted in place of " I.P.E." and should therefore be used by all members.

In order to avoid unnecessary expenditure, the existing address plates at Headquarters will be re-embossed to give effect to the change. Bearing in mind that this will involve changing over 8,000 plates, to be fitted in with other work, some months may elapse before this is completed.

FIRST MAUDSLAY SCHOLARSHIP An announcement of unusual interest to young engineers is made by the Maudslay Society concerning the establishment of the Maudslay Scholarship.

The Society was founded in 1942 in order to " perpetuate and preserve the memory and work of Henry Maudslay and his associates and successors in the engineering firm which he founded and . . . to promote by subscription or otherwise Scholarships, Exhibitions or other form of permanent Memorial in their memory "

The originators of the Scholarship scheme seek the support of all engineers for this eminently worthy cause, and to this end have published an absorbing brochure which gives an illustrated history of the famous firm of Maudslay Sons & Field, Ltd., and full details of the conditions governing the Scholarship awards. Proceeds from the sale of this brochure, which is obtainable from the Secretary of the Maudslay Society, Mr. W. W. S. Robertson, B.Sc. (Eng.), M.I.Mech.E., Lynton Works, Bedford, price 5/- (postage 4d.), will augment the Scholarship Fund.

TECHNICAL APPOINTMENTS (1) A full-time lecturer is required by the Scunthorpe Technical College, principally for Science and Mathematics in Craft Courses in Mechanical Engineering (e.g., Machine Shop Engineering), to City and Guilds Intermediate standard. A degree in engineering or equivalent qualifications are desirable, and experience in industry is essential. Duties will commence in September, 1950.

Full details and forms of application may be obtained from The Principal, Scunthorpe Technical College, Cole Street, Scunthorpe, Lincs.

(2) Applications are invited for appointment as Lecturer in Production Engineering at the Royal Aircraft Establishment Technical College, Farnborough, Hants. Candidates should hold an engineering degree or equivalent qualification, preferably have had some teaching and industrial experience, and be capable of teaching to Higher National Certificate standard. Research work facilities may be available to a suitably qualified candidate, and duties will commence as soon as possible.

The salary will be in accordance with the Burnham scale for Assistants in Technical Colleges, plus allowance for training, qualifications and experience, and subject to Teachers' Superannuation Acts. Further particulars are obtainable from The Principal, R.A.E. Technical College, Farnborough, Hants.

NEWS OF MEMBERS

Mr. J. Addy, Associate Member, has been appointed Managing Director of High Wycombe Foundries Ltd. (incorporating R. Blandy & Co.), High Wycombe, Bucks.

Mr. F. Cotton, Member, has been appointed Works Manager of Coventry Climax Engines, Ltd., Coventry. Mr. Cotton is a member of the Coventry Section Committee.

Mr. F. George, Member, is now Works Manager of the Radcliffe factory of Mather and Platt, Ltd.

Mr. E. H. Holder, Associate Member, has been loaned to the Air Ministry for service abroad with the Royal Air Force, and is at present in Germany in the capacity of Technical Adviser (Production and Methods) on Aircraft Engineering.

Mr. A. L. King, Member, is now Works Manager of Fortiphone, Ltd., London.

Mr. F. P. Laurens, O.B.E., Member, Director-in-charge of Engineering at the Barrow Works of Vickers-Armstrongs, Ltd., has been appointed Deputy General Manager.

Mr. L. E. Luck, Associate Member, has resigned his appointment at Cardiff Technical College, and has left the U.K. for Sydney, Australia, where he intends to settle permanently.

Mr. C. N. T. Manfull, Associate Member, Hon. Secretary of the Nottingham Section, has accepted an appointment as part-time lecturer at the Nottingham and District Technical College.

Mr. G. A. Pickard, Associate Member, is now Works Manager of Brierley Engineering Co. Ltd., Letchworth.

Mr. V. J. Vaughan, Associate Member, is now General Works Manager of Multi-Spring Mattresses, Ltd., St. Ives, Cornwall.

Mr. G. E. Warner, Intermediate Associate Member, has been appointed Personal Assistant to the Works Manager at John Fowler & Co. (Leeds) Ltd.

VISITORS FROM ABROAD Mr. J. A. Maddock, Member, is at present visiting the United Kingdom. He is Consulting Engineer to G. N. Raymond, Ltd., Melbourne.

Mr. J. A. Maddock

Mr. Maddock was educated and served his apprenticeship in Leicester, England, and spent his early business life in Leicester and Sheffield. After visiting Australia in 1936, he settled down there permanently in 1938.

He is visiting Europe to obtain certain specialised technical information, as well as for pleasure. Until August 10th, his address will be Westminster Bank, Ltd., 1, Milton Road, Leicester.

Another visitor from Australia is Mr. S. E. Green, Associate Member, of Sydney Section. As a representative of the Commonwealth Industrial Gases Ltd., he is investigating development and sales trends as applied to the welding industry in the United Kingdom, and in America.

OBITUARY The Institution records with deep regret the death of Mr. F. C. Clarke, Member. Mr. Clarke was Principal of Rotherham College of Technology until his retirement two years ago, and was a member of the Sheffield Section Committee for many years.

BOOKS RECEIVED "Diesel Maintenance—A Practical Guide to the Servicing of the Mordern Transport Diesel" by T. H. Parkinson, M.I.Mech.E. Edited by Donald H. Smith, M.I.Mech.E., Assoc.Inst.T. (Third Edition). Iliffe & Sons, Ltd., London. Price 7/6d. net.

Note:—In the March issue of the Journal there was published a review of "Technology of Light Metals" by A. von Zeerleder, published by the Elsevier Publishing Co. Inc., of New York, at $7.50. The Institution has since been informed that the British Empire distributors for this book are Cleaver-Hume Press, Ltd., London, and the London price is 45/-.

ISSUE OF JOURNAL TO NEW MEMBERS Owing to the fact that output has to be adjusted to meet requirements, and in order to avoid carrying heavy stocks, it has been decided that the Journal will only be issued to new Members from the date they join the Institution.

Major C. B. Thorne, M.C.

Following the resignation of The Secretary, Major C. B. Thorne, M.C., at the Council Meeting held on 27th April, 1950, Mr. W. F. S. Woodford has been appointed Acting Secretary of the Institution.

Publication of June Journal

The June, 1950 issue of the Journal will be published towards the middle of the month, in order that adequate space may be given to the Mechanical Handling Exhibition at Olympia.

SECTION MEETINGS

The following meetings have been arranged to take place in May and June, 1950. Where full details are not given, these have not been received at the time of going to press.

May

3rd **Nottingham Section.** The Presidential Address will be given by Mr. J. H. Bingham, M.I.Mech.E., M.I.Prod.E., F.I.I.A., at the Victoria Station Hotel, Milton Street, Nottingham, at 7.0 p.m.

3rd **Wolverhampton Section.** A lecture on "An Assessment of Production Engineering Training" will be given by Mr. T. B. Worth, M.I.Mech.E., A.M.I.E.E., M.I.Prod.E., at the West Midland Gas Board Demonstration Room, Clarence Street, Wolverhampton, at 7.0 p.m.

4th **London Graduate Section.** A lecture on "Production Control as a Tool of Management" will be given by Mr. M. J. Sargeant, Grad.I.Prod.E at the Institution of Production Engineers, 36 Portman Square, London, W.1, at 7.15 p.m.

9th **Birmingham Graduate Section.** An address will be given by the Section Chairman, Mr. R. V. Brown, Grad.I.Prod.E., at the James Watt Memorial Institute, Great Charles Street, Birmingham, at 7.0 p.m.

9th **Wolverhampton Graduate Section.** A lecture on "'X' Ray of Castings" by Dr. L. Mullins, will be given at the Wolverhampton and Staffordshire Technical College, Wolverhampton, at 7.15 p.m.

13th **Western Section.** An all day Conference on "Materials Handling" will be held at the Victoria Rooms, Bristol, commencing at 10.30 a.m.

18th **Southern Section.** A lecture on "Tungsten Carbide Tool Application" will be given by Mr. F. H. Bates, A.M.I.Prod.E., in the Physics Theatre, University College, Southampton, at 7.15 p.m.

20th **Coventry Section.** An all day Conference on "Materials Handling" will be held at the Ryton Works of Messrs. Humber Limited commencing at 9.30 a.m.

24th **Liverpool Section.** A lecture on "The Production Engineer—His Education and Training" will be given by Mr. T. B. Worth, M.I.Mech.E., A.M.I.E.E., M.I.Prod.E., at the Exchange Hotel, Tithebarn Street, Liverpool, at 7.15 p.m.

May—*cont.*

24th **London Graduate Section.** A visit has been arranged to the De Havilland Engine Co. Ltd., Stonegrove, Edgware, Middlesex, commencing at 2.15 p.m.

31st **Shrewsbury Sub-Section.** A lecture on "Payments by Results Critically Examined" will be given by Mr. E. C. Gordon England, F.R.Ae.S., M.I.Prod.E., F.I.I.A., at the Walker Technical College, Oakengates, at 7.30 p.m.

June

13th **Wolverhampton Graduate Section.** A lecture on "The Effective Use of Materials" will be given at the Wolverhampton and Staffordshire Technical College, Wolverhampton, at 7.15 p.m.

24th **Birmingham Graduate Section.** Annual Outing. Members will be notified of detailed arrangements in due course.

SECTION ACTIVITIES

BIRMINGHAM The year opened with Mr. E. A. Hyde's paper on "Factory Administration from the Accountant's Viewpoint", and in February a joint meeting was held with the Birmingham Branch of the Institute of Cost and Works Accountants, when "Productivity and Costs" was the subject introduced by Mr. W. S. Rick.

The two practical type papers of this quarter were "Drop Forging" by Mr. John Sharman, and "Automatic Bar Machines From The User's Point of View" by Mr. A. W. Nye.

The Annual Dinner Dance on 25th March, 1950, was one of the most successful yet organised, the chief guest being Major-General K. C. Appleyard, C.B.E., President Elect. Also present was Professor Juran, Head of the Administrative Engineering Department of New York University, who on 27th March gave a most interesting address at a special meeting of Midland executives organised by the Section.

Working Parties have been formed to facilitate discussions on Productivity and Mechanical Handling, and all members are invited to contribute to these activities.

The Committee wish to record their appreciation of the prompt and efficient assistance of Headquarters Staff in circulating the many notices and details concerning the recent activities of the Section.

BOMBAY In February a most interesting film on "Generation of Metallic Bearing Surfaces", produced by the Micromatic Hone Corporation of America, was shown to a large audience.

Applications for membership continue to be received at a very satisfactory rate, and the Section is making rapid progress.

CALCUTTA In January, a paper on " Training Within Industry ", by Dr. S. K. Bose, was very well attended, and in February Mr. R. Misra spoke on " Precision Grinding ". This was followed in March by a lecture on " Shipbuilding and Shipbuilding Yards " by Mr. P. Basu.

DUNDEE Four meetings have been held and papers on a wide range of subjects read and discussed. One extra meeting was arranged outside Dundee in the small county town of Brechin, in order to rouse interest in the Institution's activities, and was very successful.

Arrangements are in hand for the Graduateship Examination, which is to be held in Dundee for the first time, and close liaison is being maintained with the Dundee Technical College, with a view to instituting a Higher National Certificate Course in Production Engineering next session.

Contact has also been established with R.E.M.E., and an invitation has been extended to all interested to attend Section meetings.

EASTERN COUNTIES For the January meeting, Mr. A. Short gave his paper on " Industrial Application of the Lost Wax Process ". This aroused much interest, and Mr. Short's visit was greatly appreciated. In February Miss A. G. Shaw spoke on " Motion Study ", supplementing her lecture by films. As a result of this meeting, many local concerns are considering further development of this scientific study.

For the March Meeting, three local members read short papers based on the Institution's Common Subject, " The Effective Use of Materials ". At this meeting the Section was pleased to welcome Mr. J. E. Hill, and Mr. W. F. S. Woodford.

The Section reports with pleasure that Mr. H. H. Dawson has kindly consented to remain in office as Section President for another year.

EDINBURGH The December lecture on " Scotland's New Industries " was given by Mr. C. A. Oakley, B.Sc., Ed.B., who made a masterly survey of the growth and movement of industry in Scotland.

In January, Lt.-Col. L. Urwick, O.B.E., M.C., read his paper on " Education for Management " to a joint meeting with the East of Scotland Branch of the Institute of Personnel Management.

Mr. N. P. Watts lectured on " Air Operated Fixtures " in February, and the demonstration of working examples proved a fascinating conclusion to an interesting evening.

The Annual General Meeting was held on 24th March, and was preceded by an informal dinner.

LINCOLN In January, Mr. S. Richard gave a well-attended lecture on " Machinery for Wire Drawing ", and in February fifty members of the Section visited the works of Rose Bros., Gainsborough, to see the manufacture of paper wrapping machines.

LIVERPOOL A most enjoyable evening was spent on 27th January on the occasion of the Section's first dance. This was a great success, and it is hoped to repeat it during the 1950/51 Session.

With regard to lecture meetings, a discussion on " The Effective Use of Materials " produced a lively debate, and many practical suggestions, and the two lectures, " Valid Incentives " by Mr. E. C. Gordon England, and " Costing As An Aid to Management " by Mr. H. H. Norcross, both had record attendances and were very well received.

The Section membership has now reached 162.

LONDON The Graduate Section has submitted three papers for the Section President's Prize. It had been decided that the President's Prize would not be awarded this year but in view of the papers submitted, this decision is being reviewed.

Mr. William Core has been regularly meeting the Chairman and Hon. Secretary of the Graduate Section, and has been able to give assistance in connection with the proposed summer tour of Sweden.

A number of members have indicated interest in discussion groups on " Measurement of Productivity " and " Mechanical Handling ". Efforts are being made to start groups and to obtain representation from a cross-section of industry in the London Section.

Two lecture meetings have been held—" The Relation between Technical Education, Training, and Production " by Mr. T. W. Price, and Mr. T. B. Worth, and " Works Organisation for Large Scale Research and Development on Aircraft Engines " by J. S. Paget. Both proved to be interesting and informative, and were followed by keen discussions.

Good progress is being made with the Lecture Programme for 1950/51, and it is intended to include subjects on the aspect of research and development in relation to production engineering.

MANCHESTER In December Mr. T. G. Rose gave his paper, " Control of Overhead Costs ". Members of the Institute of Cost and Works Accountants, who had accepted invitations to attend, contributed largely to the vigorous discussion following the paper. An excellent paper was given in January by Mr. Walter C. Puckey on " Measurement of Productive Efficiency "; for the February meeting, Mr. J. McHenry spoke on " Advance of Industrial Heat Treatment ".

Mr. McHenry repeated his lecture in March at Crewe, where in January members had heard Mr. R. F. Archer speak on " Effective Use of Materials ".

NOTTINGHAM An exceedingly good paper was read by Dr. W. A. Tuplin in January, on " Noise and Vibration in Machinery ". This was followed in February by " Joint Consultation ", given by Mr. F. E. Maer and Mr. Cyril Dee. At the Annual General Meeting in March, Mr. G. H. Rippon was elected President and Mr. E. Barrs, Vice-President.

After the Annual General Meeting, Mr. Barrs and Mr. Guyler spoke on " Marketing Abroad ", and in April, Mr. J. H. Smith lectured on " Costing for Small Engineering Firms ".

The Commanding Officer of the R.E.M.E. Depot at Chilwell is interested in the Institution's work, and it is hoped that officers of this Command will shortly be joining in the Section's activities.

READING The inaugural meeting of the Reading Sub-Section was held on 21st February, 1950, when Mr. B. H. Dyson read his paper on " The Production Engineer's Responsibility for Productivity ". The meeting was an outstanding success, and among the guests were the Mayor of Reading, Mr. J. E. Hill, and Mr. William Core, President of the London Section.

A further meeting was held on 21st March, when Mr. E. C. Gordon England spoke on " Valid Incentives ". This was followed by a lively and interesting discussion.

SHEFFIELD All lecture meetings have been very well attended, and appreciation has been freely expressed by many members. The December meeting was addressed by Mr. R. G Baker, who showed outstanding knowledge of the problems of Modern Coal Production.

In January the Section was privileged to hear Dr. H. Schofield, C.B.E., President of the Institution, speak on " The Education of The Production Engineer". This provoked a very lively discussion in which prominent local educationalists and industrialists took part.

Extremely interesting lectures were given in February and March, by Mr. R. K. Allan on " The Manufacture of Ball and Roller Bearings ", and by Mr. W. Bailey on " Development in Design and Manufacture of Heavy Steel Works Plant ".

The informal meetings held in January and February were found to be of great interest, and it is proposed to continue them.

SOUTH AFRICA Mr. M. M. Hunter, of Consolidated Glass Works, Wadeville, Germiston, delivered a paper entitled "The Glass Container Industry " to the February meeting, and in March Mr. A. C. Blundell-Gibson spoke on " Correct Selection of Arc

Welding Electrodes ". During February, also, a visit was paid to Stewart Lloyds of South Africa, Ltd., in Vereeniging.

SOUTHERN An attractive and varied programme of monthly lectures has been arranged up to the end of May, 1950. Following a film show in January, Mr. J. Whitaker, B.Sc(Eng)., A.M.I.Prod.E., gave an excellent paper in February on " The History and Development of the Diesel Engine ". In March, Mr. M. Seaman, M.Sc., M.I.Prod.E., spoke on " Production Management Problems ".

A series of Works Visits is being arranged in order to maintain interest during the summer months.

The Annual General Meeting in March was preceded by an informal dinner party, and on this occasion the Section was honoured by the presence of the Chairman of Council, Mr. J. E. Hill, who gave an excellent address on the activities and future aspirations of the Institution. Mr. T. B. Worth, who also attended, dealt in admirable fashion with the many questions on Institution educational policy.

One of the Section's main difficulties has been in enlisting the services of a suitable member to carry out the duties of Hon. Secretary, but this problem has now been solved, as Mr. J. W. Taylor, Associate Member, has accepted the office for the coming season.

SYDNEY The Section has been in recess since the completion of the 1949 programme in October last, with the exception of Committee Meetings. A comprehensive syllabus has been completed for the 1950 Session, including lectures on both technical and management aspects of Production Engineering. Visits to industrial plants have also been arranged.

The Session opened with a splendid paper, " Observations Overseas " by Mr. A. D. Abbott, Works Manager of the Small Arms Factory, Lithgow, who had just returned from overseas. Mr. Abbott spoke of his experiences and described many interesting developments in Great Britain.

WEST WALES In January a very responsive audience heard Mr. T. B. Worth speak on " The Production Engineer—His Education and Training ". This meeting was attended by prominent local industrialists and educationalists.

In February Mr. E. R. Gadd gave a most interesting paper on " The Metallurgist's Place in Production Engineering ", and a very large audience was pleased with Dr. E. G. West's lecture on " The Effective Use of Materials ". There is no doubt that this lecture was well suited to all branches of the local industries.

MECHANICAL HANDLING

by F. T. DEAN, M.I.Mech.E., M.I.Prod.E.*

Presented to the Preston Section of the Institution, October 5th, 1949

MECHANICAL HANDLING is a subject which is receiving close attention in these days of man-power shortage, as can be seen from the attendance figures at the Mechanical Handling Exhibition which was held in London last year. There is little doubt that it will in future play a much greater part in industry, and it is in the interest of Works Managers and Engineers to keep themselves abreast of the developments that are continually taking place.

In the past, many manufacturers have dismissed the subject lightly by saying that conveyors may be an asset in mass production plants like motor-car factories, but they cannot be adapted to suit their conditions. In addition to this, the word "conveyor" suggested to many people nothing more or less than a flat or troughed belt conveyor or a length of roller track. Within the last few years, however, ideas have changed considerably. In most countries there is a shortage of man-power, and in others the cost of labour has so increased that mechanical handling has become a necessity. In addition, manufacturers are realising the extent to which mechanical handling has advanced, and to appreciate the fact that the mechanical handling engineer has something to offer almost every industry.

Costs and conditions vary considerably from one factory to another, but it has been estimated by one American authority that in that country 22% of the total labour cost of production is expended in moving and handling operations. It is probably much higher in the U.K. In one foundry for example, I have read that 140 to 200 tons of material are handled for every ton of castings produced. Of this material, sand is of course the biggest item and it has to be moved continually from one process to another. This problem of handling and transport exists in every industry to a greater or lesser degree, and it is obvious therefore, that the reduction of costs can be tackled here in a big way. In the past, and even now to a certain extent, there have been prejudices against and objections to labour-aiding devices from all kinds of people. This attitude is gradually disappearing, and some of the people who used to complain so bitterly about conveyors are now the people who are most indignant when a conveyor is out of service owing to a mechanical breakdown or some other cause.

* *Chief of Materials Handling Advisory Dept., G. W. King, Ltd., Hitchin, Herts.*

Mechanisation, coupled with efficient planning, appears to be part of an irreversible trend of present life, and we as a nation can only maintain and improve our present position in the world by the fullest use of both.

A GENERAL SURVEY I want to give some idea of the range, advantages, and limitations of modern mechanical handling and some general applications, so that in whatever branch of industry you are interested you may face your problems with a slightly better knowledge of the subject.

There are many excellent books in the technical libraries of our leading institutions giving standard designs and practices, so I only wish to deal as briefly as possible with this part of the subject to make the more advanced applications understandable.

To begin with, mechanical handling equipment may be divided roughly into three groups ; gravity operated, hand operated, and power operated.

GRAVITY OPERATION The first and smallest group consists of simple timber or metal inclined chutes, either straight or spiral, and roller conveyors. Chutes require a fairly steep incline, but will handle with safety boxes, crates, sacks, etc., and loose material like sand, swarf and coal. The spiral chute is particularly useful in a confined space for lowering good distances safely without much horizontal movement. It should be borne in mind that the design and manufacture of spiral chutes is a very specialised job, as it is essential that the pitch and radius be correct for the type of package to be handled, and, once made, it is a very expensive matter to make any alterations. Owing to the steep incline required for straight chutes, they are replaced by gravity roller conveyors whenever much horizontal movement is required.

The gravity roller conveyor, a cheap and simple device, is so useful and so adaptable that no large factory is complete without long lengths of it. It is usually made in 8-ft. or 10-ft. lengths of light framework, with ball bearing rollers and steel spindles to suit its particular duties. It will carry fairly heavy loads over long distances requiring a fall of only 3% to 5% or say $\frac{1}{2}$ in. per foot run. For particularly long runs, power operated booster elevators are placed at intervals to raise the articles to a desired height before allowing them to run down again by gravity. Bends and curves can be supplied to avoid obstacles or connect operations, and two-way or three-way junctions may be added to bring together various flows of material or to separate them for sorting.

HAND OPERATION The next group, the hand operated, has a slightly wider range taking in overhead monorail runways, pulley blocks, and light cranes. The first, the overhead runways, are either standard rolled steel joists, or special steel sections suspended

from roof steelwork, or specially made structures. Switches, crossovers, and turntables can be supplied and some very complicated layouts can be achieved. Weighing machines can also be incorporated so that goods can be weighed without taking them out of the system. The tracks may be curved in the horizontal plane, but for hand-operated loads there should not be any vertical bends. This type of equipment is very cheap and adaptable, and in the case of the very light section shown in Fig. 1, which is known as Double Bead Track, it can be bent on site by the erectors, despite

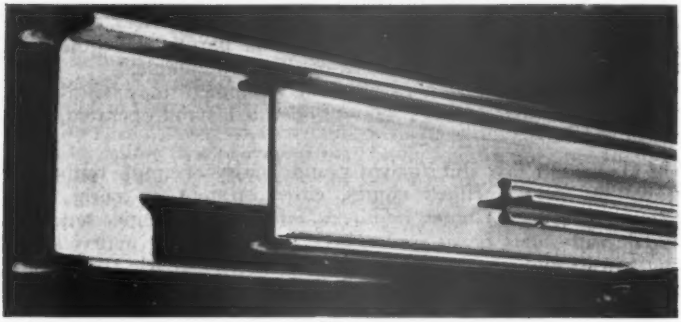


FIG. 1.

taking a load of 5 cwts. over a span of 2 feet. This particular section has gone out of favour in this country in recent years owing to the fact that a good deal of supporting structure is needed, but it is still very popular in those countries where timber can be obtained more readily than steel. Hand operated pulley blocks are attached to the trolleys that run on these various rails, or in some cases special carriers or containers are used.

Fig. 2 shows an overhead runway in a printing works, and one can see the switches by which the trolleys pass from the main track to the branch tracks between the machines. This runway was used for handling the heavy copper cylinders used in this class of work, and it made life a good deal easier for the operators concerned, besides saving a lot of damage to the cylinders.

Light hand-operated cranes are only an extension of the monorail runways, and the two may be operated together very successfully to cover a wide area.

POWER OPERATION Power-operated conveyors form the largest group of all, and may be divided again into three groups, i.e., floor type, elevating type and overhead type. In the first group the simple belt conveyor is the most common.

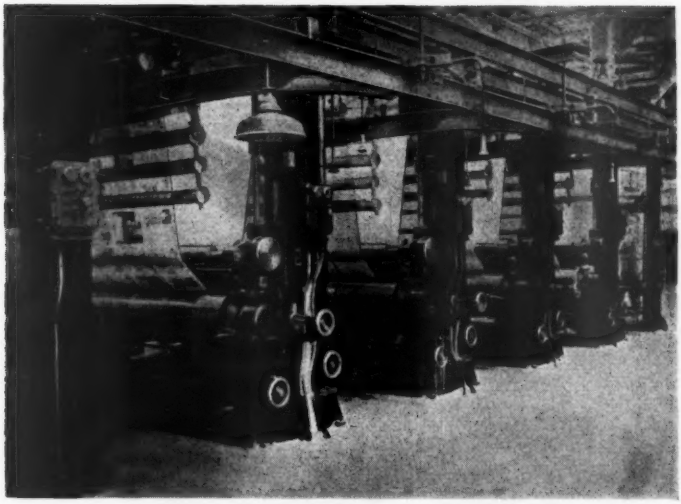


FIG. 2.

The belt may be flat or troughed and in the former case it is widely used for carrying boxes, cartons, etc., and at a comparatively low speed of 25 to 50 feet per minute will allow packing, sorting and inspection. When troughed and run at a higher speed up to 800 feet per minute, a belt conveyor will carry coal, coke, sand or grain in very large quantities. A troughed belt 60 inches wide carrying material weighing 150 pounds per cubic foot at 100 feet per minute will convey something like 800 tons per hour, and through almost all weathers and conditions when barrows and trucks could not move. Belts will convey up moderate inclines and when the conveyors are made portable they are particularly useful for such tasks as loading railway wagons.

For heavier and more specialised work the belt of cotton or rubber and canvas is replaced by chains and slats or buckets. The cost of these conveyors is considerably greater, but they are much stronger and will stand rougher treatment. They can be made to convey in either direction, and feed and discharge at various points along their length.

A slat conveyor makes a good assembly line as one end of it can be situated in the stores, and all the necessary components can be fed on to it in sets at the desired intervals. Assembly fixtures can be mounted on the slats at the necessary spacing and the length

and speed of the conveyor can be calculated with ease. For assembling larger units a single strand or double strand chain conveyor can be used. This particular type of conveyor is made flush with the floor in order to cause as little obstruction as possible to the men doing the assembly work. Fig. 3 shows another type of single strand assembly conveyor for motor vehicles. You will

FIG 3.

notice that in this case the chassis is mounted on a truck, and the whole thing is arranged in such a manner that a high degree of accessibility is obtained.

A similar type of conveyor is shown in Fig. 4, being used to assemble pre-fabricated houses. The speed in this case is particularly low as the assembly operations are much slower.

When a double strand chain conveyor is used, the units being assembled rest on the chains and the height of the conveyor is made to suit. (Fig. 5.)

The floor conveyor shown in Fig. 6 combines storage and movement, and it was first used in a carburising plant. The carburising boxes come from the furnaces at a very high temperature and are placed on the top conveyor for cooling. The top conveyor consists of two strands of chain with loose slats of cast iron mounted on wheels which rest on the chains. The hot boxes are placed on these slats and travel very slowly from one end of the conveyor to

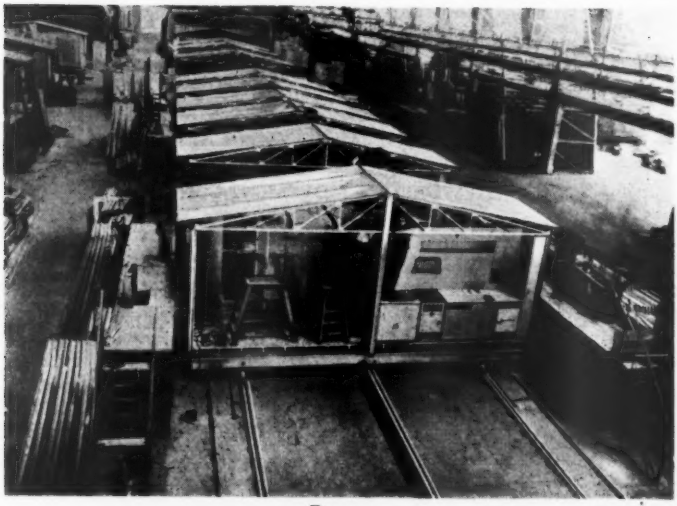


FIG. 4.

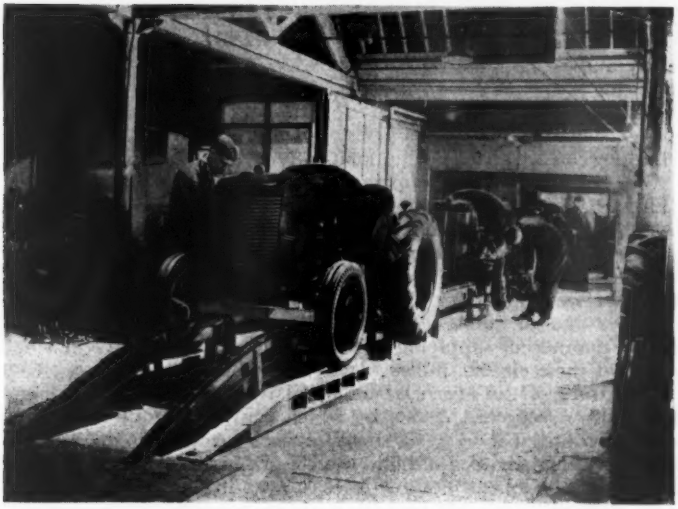
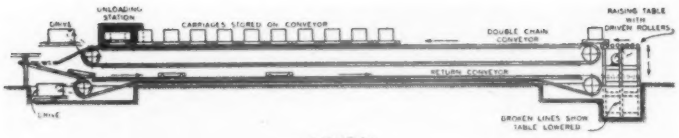


FIG. 5.



ELEVATION

COMBINED STORAGE & MOVEMENT CONVEYOR

(Patented.)

FIG. 6.

the other. At the unloading end there is a special stop and when the slats reach this they stand still, while their wheels revolve as the chains pass under them. All the slats thus slowly accumulate at the discharge end, and when the first one is removed the others all move up one place. The boxes are removed from the first slat, which then runs on to a special section by which it is transferred to a pair of high speed chains underneath, which return it to the loading end. It is then raised to the top chain level ready for loading and the process is repeated.

TYPES OF ELEVATORS The next group covers elevators of various types. These can be made with belts or chains and buckets, and they can cause great difficulties in design according to the material they are handling. Coke and sand are perhaps worst of all, and special precautions must be taken in both cases. Coke will wear anything away and replaceable liners must be provided throughout. Sand will clog everything until it just jams solid, so that provision must be made for clearing out the boots and buckets. For boxes and crates, swing tray elevators do good work and both feeding and discharging can be carried out automatically at various floors and heights.

The last group of power operated conveyors is the overhead group. (Fig. 7.) The simplest form is the power operated monorail runway which consists of the usual form of runway fitted with an electric pulley block, which in some cases has electric travelling gear. For short lengths of travel, power may be supplied from a festooned cable or from a reeling drum. For longer lengths and through switches and turntables, busbars are used in a way very similar to the manner of supplying power to trolley buses. The normal range of these electric pulley blocks is anything up to 10 tons.

A feature of the overhead monorail runway worth mentioning is the drop section, a device by which runways of different levels can be connected. Fig. 8 shows a drop section in an aircraft factory which enables a high level runway in a lofty assembly building to be joined to a low level runway in the stores where the roof is much lower. Automatic stops are provided to prevent the trolleys from running off the open ends of the runway tracks.

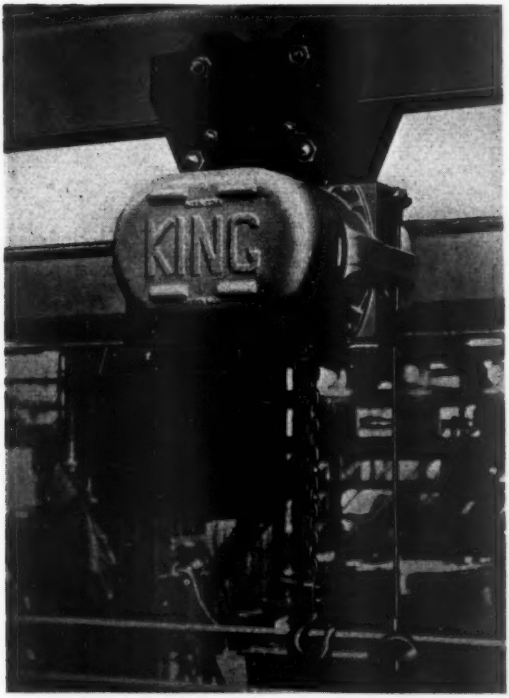


FIG. 7.

OVERHEAD CRANES Overhead travelling cranes are a more complicated version of the monorail runway covering a wider area, but doing a similar job. Their design and installation would call for a separate paper altogether, but there is one feature worthy of mention, namely the automatic latch, by means of which an underslung crane can be connected to a monorail runway so that the pulley blocks and trolleys can pass freely from one to another. Fig. 9 shows a crane latch in the free and locked positions. In the upper picture the crane has been lined up to the runway track, but the latch has not been locked. In the lower picture the latch has been locked and the stops raised to allow the trolleys to pass over. A cut-out switch is included, which prevents the travelling

FIG. 8.

motor of the crane being started while the latch is locked. When the latch has been unlocked and the crane moved away it is not possible to lift the safety stops, either on the crane track or the runway track. It is also possible to use the same device to join two or more cranes together. Fig. 10 shows two cranes being used independently in a factory producing the famous Wellington bomber, while in Fig. 11 the cranes are shown latched together so that the pulley blocks can pass from one side of the building to another. This feature proved to be invaluable for the assembly of large aircraft as the buildings had to be so wide to accommodate the enormous wing spans.

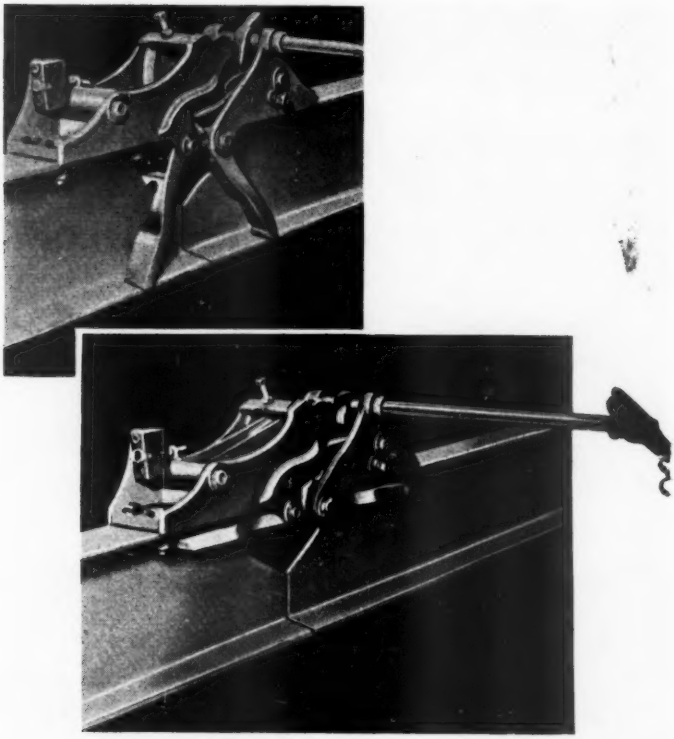


FIG. 9.

CONTINUOUS CHAIN CONVEYORS The other important type in the overhead group is the continuous chain conveyor, which can be of the monorail or twin rail type. Dealing first with the former type, this consists of a series of trolleys which run on an overhead rail and which are connected by a continuous chain. The loads to be carried are suspended from these trolleys by means of suitable slings or carriers, and the conveyor chains are of the universal type so that the track rails may be bent in both the vertical and horizontal planes. Conveyors of this type can handle loads from a few pounds to one ton per trolley, and the trolleys are usually spaced at intervals up to about three feet. The size of the articles to be handled determines the spacing at which they can be carried,

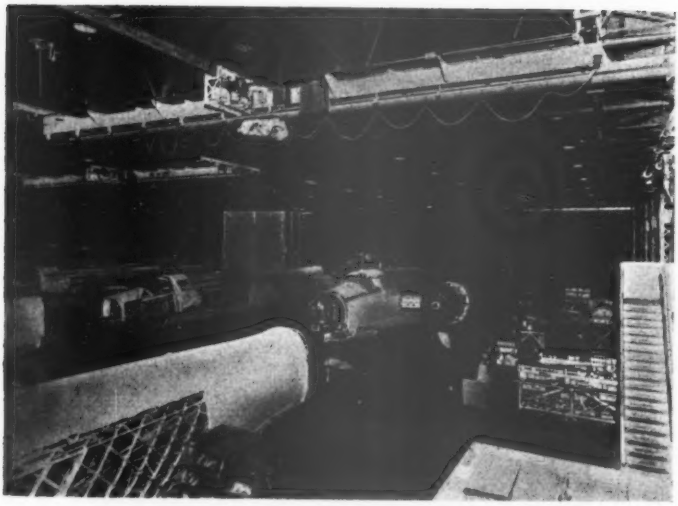


FIG. 10.

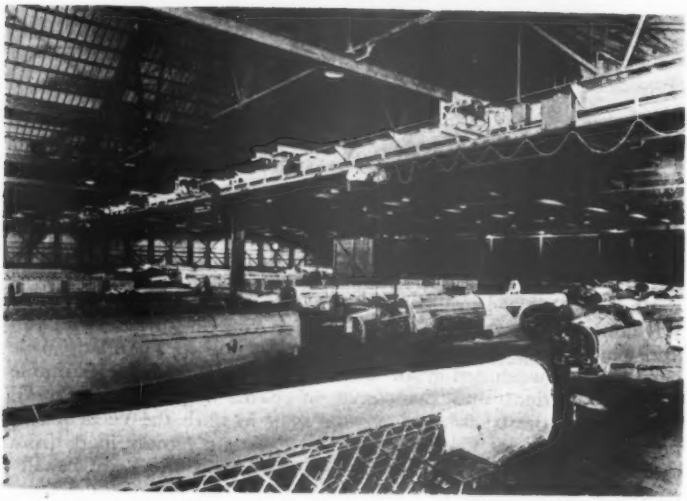


FIG. 11.

FIG. 12.

and the quantity to be handled in a given time determines the speed at which the conveyor will run. (Fig. 12.)

This type of conveyor is normally used for one of two purposes, either as a means of transport from point to point or to carry components through process work. When used as a means of transport they usually run at a speed somewhere between twenty and fifty feet per minute, depending on the number of components to be handled in a given time and the ease with which they can be loaded on to the conveyor and unloaded at the different delivery points.

Conveyors of this type can be made to thread their way through

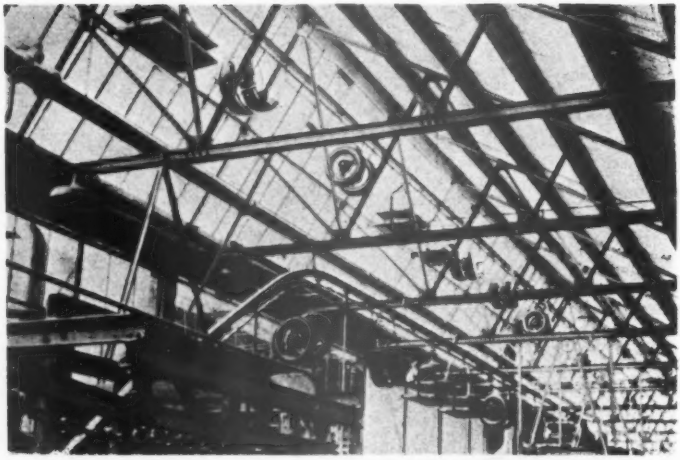


FIG. 13.

all kinds of places and in Fig. 13 you can see motor car parts being carried along high up in the roof, out of everybody's way, and free from knocks and scratches.

LOADING AND UNLOADING Automatic loading and unloading devices of various types have been made to suit different conditions, and I would like to show a few types. In Fig. 14 can be seen a bucket which was used for carrying small forgings from the inspection department to the stores. Between the bucket and the chain is a row of selecting fingers, by which it is possible to select from a large number of stations the one at which the bucket will be unloaded. These fingers are set at the loading station. Fig. 15 shows the unloading stations which can, of course, be located anywhere in the factory. It will be observed that about twelve stations are shown out of a total of seventy-four. The fingers on the bucket operate electric cam switches when the bucket comes to its correct station, and these in turn energise a solenoid which drops a ramp in front of the wheels on a sliding door at the bottom of the bucket. These wheels run up the ramp and lift the door so that the load is discharged from the sloping bottom of the bucket. One of the buckets can be seen discharging into a bin.

Another type of unloading mechanism is seen in Fig. 16. In this case the conveyor is bringing cylinder blocks from the foundry to the machine shop, and it delivers each block to one of five machining lines, according to its type. Loading is carried out by

hand, and the loader inserts one of five notched identity plates into each carrier according to a pre-determined plan. When the carrier comes to the head of the correct machining line for the cylinder block which it is carrying, the notched plate operates an electric cam switch which sets in motion an electro-hydraulic thruster. You will notice that the carriers are designed in the form of fingers or a grid, and the thruster in rising lifts through the grid a piece of gravity roller track. This takes one cylinder block off the carrier and then tilts to allow it to run off on to a fixed roller track and down to the first machine for the first operation. In doing so, it operates another cam switch which returns the lifting section to its normal position. The carriers meanwhile pass on absolutely unchecked. Should the machining line be full another cam switch prevents the block being unloaded. Finally as the empty carriers return for re-loading they are automatically stripped of their identification plates.

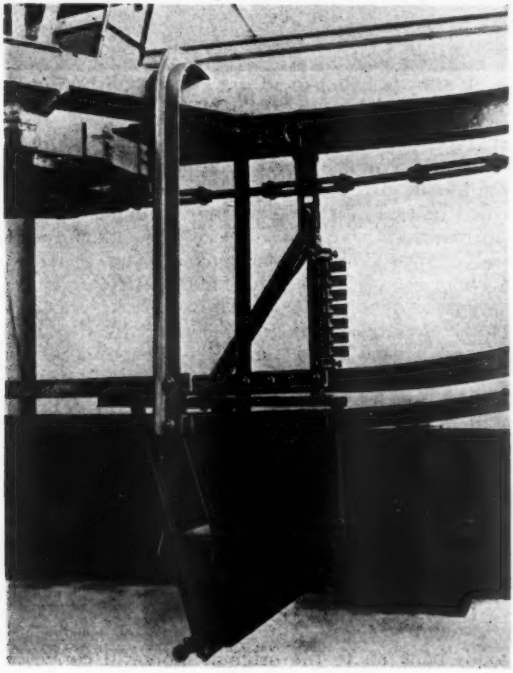


FIG. 14.

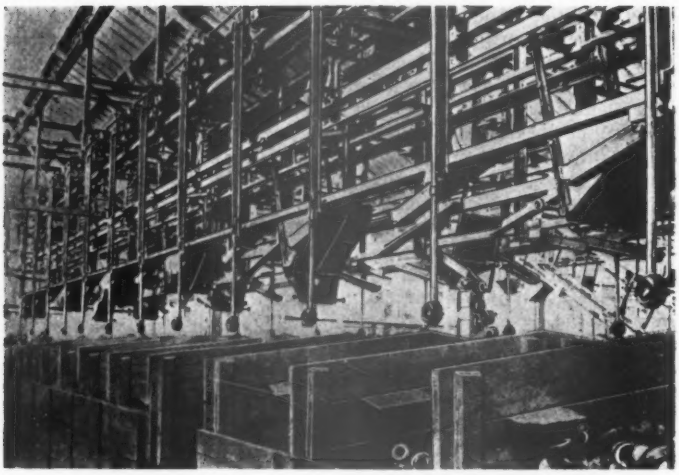


FIG. 15.

Another type of automatic loading and unloading gear was developed a short time ago in connection with some special plants which were put in for cleaning, bonderising and painting parts of pre-fabricated houses. In this case the components are loaded by hand on to load bars about twelve feet long which are suspended from hooks on an overhead monorail conveyor. This is done at the point where the components are made and the conveyor then runs into the paint shop. When each bar reaches a point opposite the end of the cleaning plant, it is lifted off by two arms driven from the cleaning plant and accurately synchronised. These arms lift the bars from the monorail conveyor and transfer them to a pair of chains which run into the cleaning section. The bars are then carried by these chains through the various cleaning tanks, a dry-off oven, a dip tank for primer paint, and a bake oven. At the end of this oven the bars with their goods are automatically loaded on to another monorail conveyor by two arms similar to those already mentioned at the beginning of the cleaning line.

This monorail conveyor then carries the bars and components through two spray booths, and after that they are unloaded by another pair of transfer arms on to another pair of chains which take them through the final bake oven. At the end of this final bake oven a fourth pair of transfer arms lifts the bars with the now painted goods back on to the original monorail conveyor, which carries them round to the assembly shop where the components are

unloaded by hand. The empty bars then continue their journey along the monorail conveyor to the starting point and the process is repeated.

Overhead monorail conveyors can also be used for storage.

VALUE ON PROCESS WORK When used for process work the speed of the conveyor is usually not more than about four feet per minute, and for this purpose conveyors are a great asset as they exercise a rigid control over the duration of the process. Fig. 17 shows refrigerator units being taken through a bath and afterwards through an oven. It can be seen that the duration of immersion and baking is very rigidly controlled, and once established there can be no doubt that every article will receive exactly the same treatment. If it is desired to vary the duration of the process a variable speed gear can be fitted to the driving unit, controlled if necessary from a remote point with electrically operated speed indicators or recorders.

Overhead chain conveyors can be designed to run in temperatures up to 400°F. and even higher if special precautions are taken to shield the chains and trolleys. There is no limit to their length as two or more driving units can be installed at suitable points and synchronised to share the load equally. Chain conveyors up to

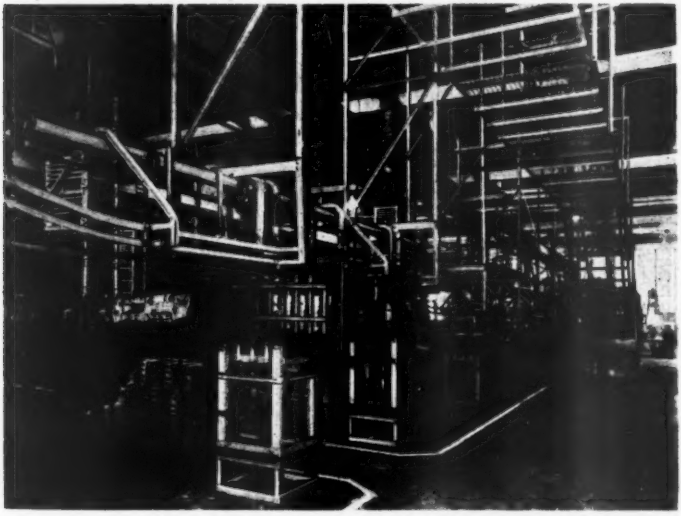


FIG. 16.

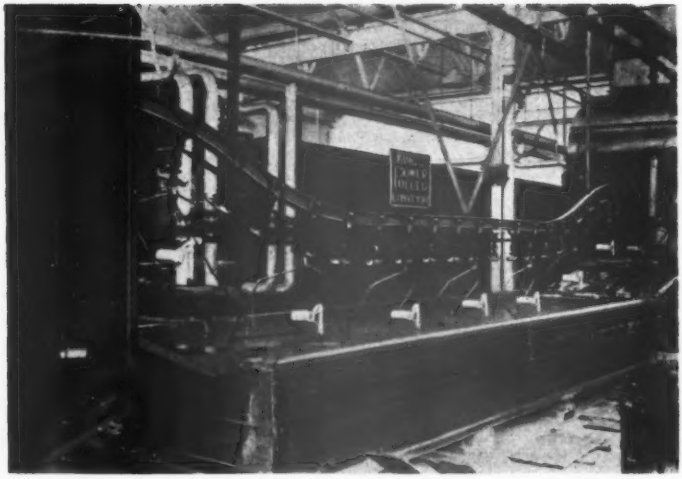


FIG. 17.

five thousand feet long have been installed in a number of places, and there is no reason at all why they should not be made even longer.

On the twin-rail overhead chain conveyor, the trolleys which carry the loads run on four wheels and they are not attached to the conveyor chain although they are propelled by it. The conveyor chain is suspended from two-wheel trolleys which run on tracks directly above those on which the load trolleys run, and to these two-wheel trolleys are fixed the pusher dogs which engage on the load trolleys and propel them forward. Retaining dogs are also fitted which engage on the leading ends of the load trolleys, and prevent them from running away on the downward slopes. The chains on these conveyors are of the universal type, so that the tracks can be bent in both the vertical and horizontal planes.

The great advantage of this type of conveyor is that the load trolleys can be diverted from the power line, by means of switches incorporated in the tracks, on to non-mechanised or " dead " lines where they can be stored, or where work can be done on the components without their being removed from the conveyor. The track switches can be operated electrically either by a push button controlled by the operator, or by a peg inserted in a hole in the bar from which the load is suspended. By this means the diverting point can be pre-selected and the operator who inserts the loaded trolley in the power line can set the peg to determine the switch at which the trolley can be diverted on to the dead line.

There are great possibilities in this type of conveyor and it has been used extensively in the motor car factories. It is now being adapted to great advantage for use in textile mills, food factories, breweries, etc. Fig. 18 shows a twin rail conveyor in a warehouse, and illustrates clearly the power line, a track switch, and a dead line between the bins.

Fig. 19 shows a twin rail conveyor carrying motor car engines from one factory to another. This conveyor was installed in 1935, and has been running ever since. Fig. 20 shows engines from the same conveyor being stored on dead lines. In the bottom left hand corner there are some more dead lines with steering columns, and in the bottom right hand corner in the distance you can see front and rear axles being carried and stored.

DROP SECTIONS Drop sections for loading and unloading can be incorporated in the dead lines, and this is a very valuable feature when handling heavy or bulky loads. A typical drop section is shown in Fig. 21 and the holes in the load bar in which the selecting peg is inserted can be seen, also the automatic stops which prevent the trolleys running off the open ends of the tracks when the drop section is lowered.

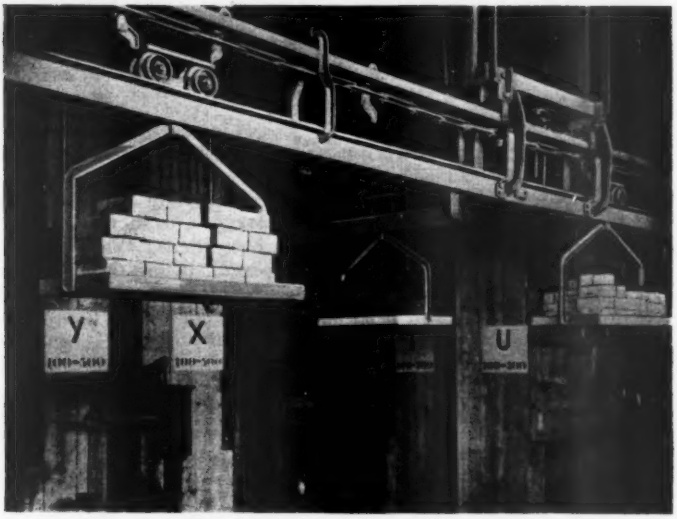


FIG. 18.

FIG. 19.

The next development is the travelling drop section which is shown here (Fig. 22) in operation over engine test beds. The engines come along the conveyor shown on the right hand side, and they are switched off at the appointed places on to short sections of dead line where they wait until they are needed. When the test bed underneath has been cleared the operator brings the travelling drop section along, lines it up to the appropriate track, pulls the engine on to it, and lowers it on to the test bed. By this means three travelling drop sections can serve twenty-four test beds. After test, the engines are taken away on the same conveyor which returns along the left hand side just off the picture.

Fig. 23 shows motor car bodies being carried on an overhead twin rail conveyor. This type of conveyor is ideal for the purpose as it would be extremely difficult to load and unload components of this nature on any other type. This particular conveyor was fitted with special mechanism to enable it to be used for storage. If for any reason the assembly conveyor was stopped, the first body would stop when it came to the unloading point, and the second

one would stop when it reached a point twenty feet behind it. The third body would stop twenty feet behind that and so on, although the conveyor was running all the time. When the first body was taken off all the others would move forward twenty feet and stop again. This feature is really invaluable under certain circumstances.

In Fig. 24 we see a twin rail conveyor being used as an assembly line. In this case the car was the Morris Ten, which has no chassis frame. The assembly of the springs, axles, engines, etc., was carried out while the body was carried overhead, and the car was subsequently lowered on to a conventional type of double strand conveyor for fitting the wheels and other final details.

There was another feature of this particular conveyor which is perhaps worthy of mention. It was found that the only way to get the bodies to the start of the assembly line was to take them right through the roof trusses. The trusses were accordingly modified in such a way that practically all the internal members were taken out, and then the two lines of twin rail conveyor were put in. There was very little room to spare, and the design of the slings presented quite a problem. The bodies had already been painted and trimmed so that the slings had to be designed to carry them without fear of damage. The space available was so small that the bodies and slings had to balance perfectly.

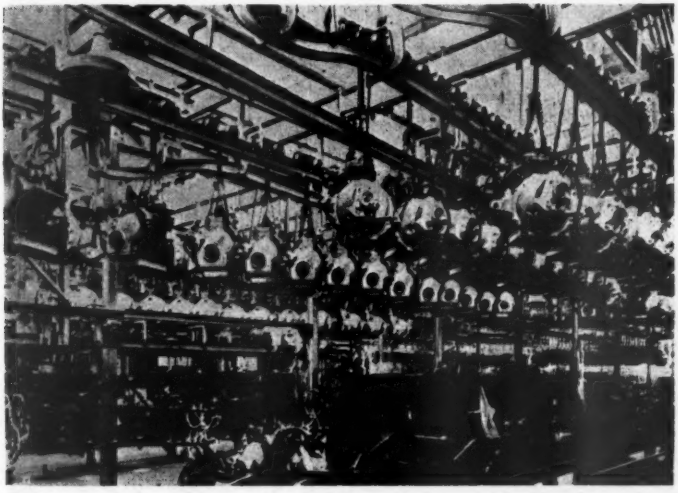


FIG. 20.

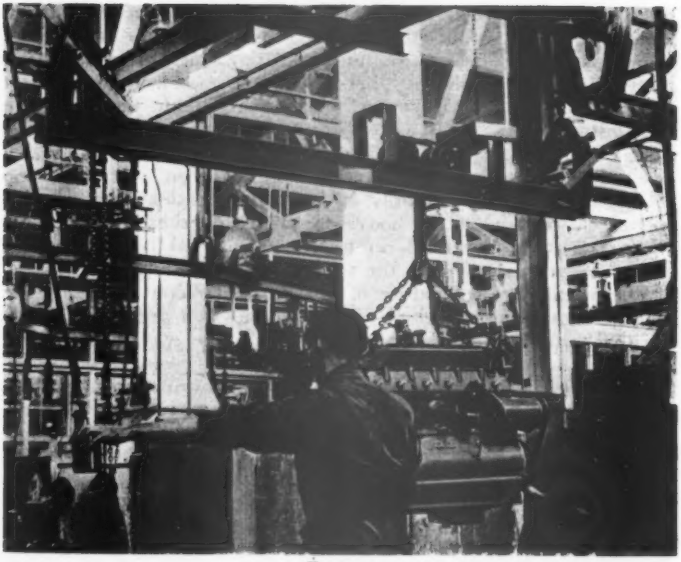


FIG. 21.

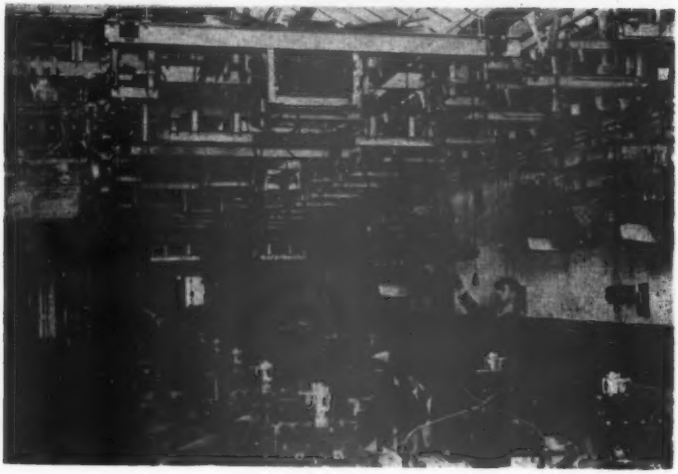


FIG. 22.

FIG 23

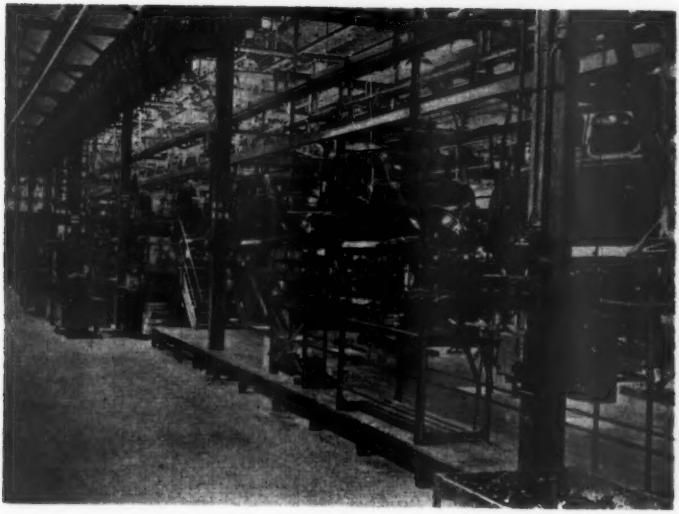


FIG 24

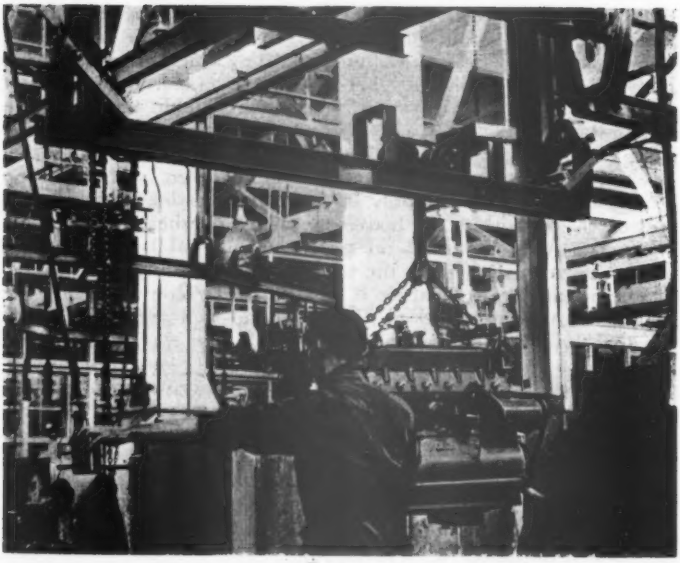


FIG. 21.

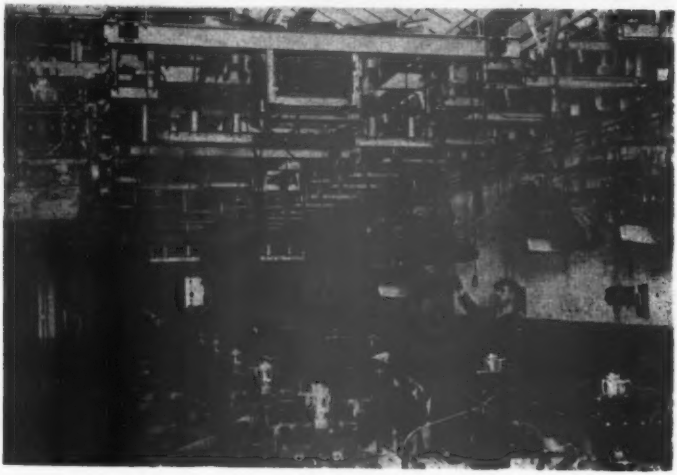


FIG. 22.

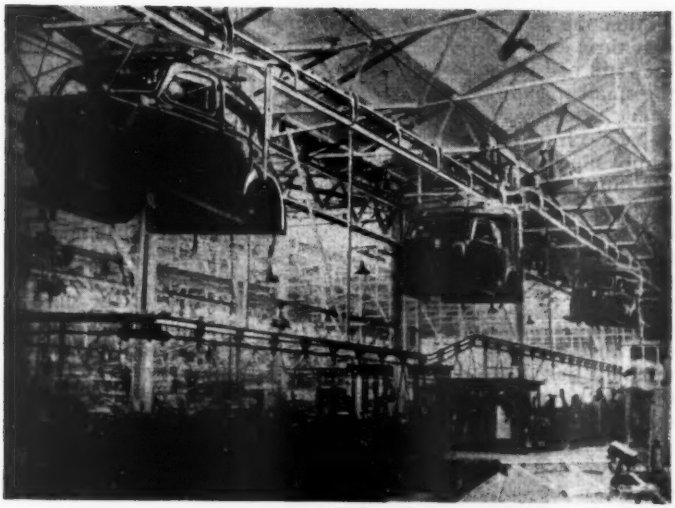


FIG 23

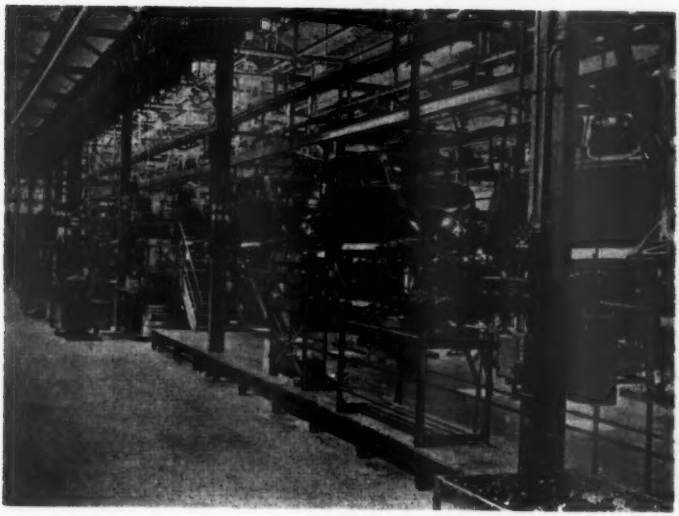


FIG 24

After the bodies had been removed, the slings had to fold up so that their depth did not exceed nine inches, and in this condition they still had to balance perfectly so that they could travel back in the small space in the left hand side of the picture.

Fig. 25 shows a " Dual Duty " twin rail conveyor carrying barrels of beer. In the background can be seen the return line taking the empty slings back. These slings are made adjustable to carry all the different sizes of barrels used in a brewery. In Fig. 26 the loading stations of the same conveyor are shown. Loading is carried out on the dead lines by means of air operated tables. In the background is one of these tables in its normal position with its top flush with the floor, having just loaded a barrel. The next barrel will then be pushed on, lifted up and fixed in the sling as shown in the foreground. The operator controls the table by means of a valve operated by his right foot, thus leaving both hands free to adjust the sling. When he is ready he releases the valve, lowers the table, and leaves the barrel hanging in the sling, to be pushed round into the live line running parallel in the background.

Fig. 27 shows the barrels being loaded on to a lorry by means of a drop section. After loading, the empty slings with their trolleys run down the sloping dead line on the left, and are taken into the live line and back to the loading stations.

FIG. 25.

FIG. 26.

REMOTE CONTROL Mention has already been made of variable speed gears and remote control on conveyors. Fig. 28 shows a control panel located in the production manager's office in a motor car factory. It controls and records the speed of five conveyors, namely, body building, chassis assembly, body trim, mounting, and final polishing after road test. The speed changes, which are infinitely variable, are effected by operating electrically the variable speed gear box on the driving unit of the conveyor concerned. All the production manager has to do to increase the speed of any conveyor line is to press the button marked "Speed up." The speeds of the body trim line and the mounting line are shown on the two circular dials, and the sensitivity of control is such that speeds can be increased or decreased by as little as $\frac{1}{8}$" per minute. The remaining three conveyors have their speeds recorded on a continuous roll chart twelve inches wide with three scales side by side showing a range from zero to twenty-five inches per minute. The roll is of the eight-day hand wound spring type. This recorder also has a separate operation pen, which draws a straight line up the chart with a small deflection every time a completed car leaves the end of a line. It will be seen from this

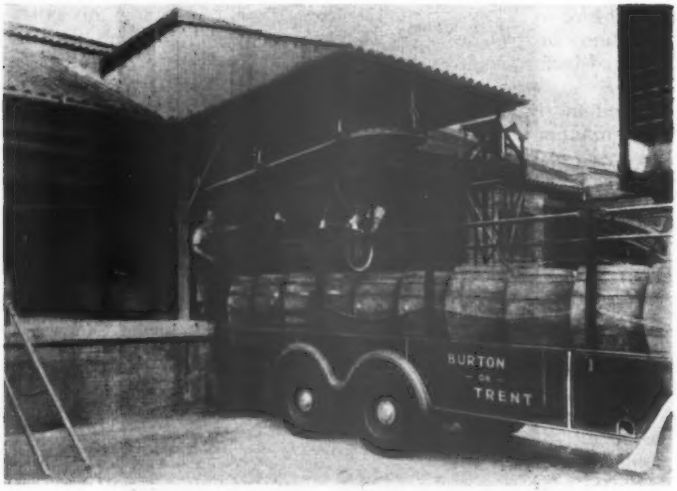


FIG. 27.

that very accurate production control can be obtained and the whole thing can be made quite impressive. There is also this advantage from the psychological point of view, that the operators are unaware of the small fluctuations in speed, and the natural reactions to seeing a conveyor speeded up mechanically do not appear.

TYPICAL LAYOUTS These disjointed scenes from various plants may appear a little confusing, so I have included finally a few complete typical layouts. Fig. 29 shows a conveyor layout for a plant manufacturing refrigerators. Here we can trace the orderly flow of various units from their first operations and processes to the final assembly. All the conveyors except the last are of the overhead monorail type. The top half of the slide shows the path of the panels and casings from the press shop to the paint spray booths. From there they are taken through the ovens for a specified length of time to bake the enamel and then on again in a continuous stream into the stores. As required, the parts are taken from the stores to the sub-assembly lines and on to the final assembly line, a floor type slat conveyor. The lower half of the slide shows the path of the machined parts. As the items come off the machining lines they are taken into the stores and when required taken out again on the same conveyor to the unit sub-assembly lines. From there, there

is a conveyor through the test section, and another through the paint section until the finished units reach the unit stores near the head of the floor conveyor. On this last conveyor they are fitted to their cases and leave the line as finished refrigerators.

The whole scheme is an effort to obtain a steady flow of production with no backward movement. The path of each item is governed mechanically and processing in the ovens completely controlled so that the output becomes regular and automatic.

An overhead twin rail conveyor in the cleaning section of a motor-bus overhauling depot is shown in Fig. 30. From the preliminary washing tanks in the bottom right hand corner the components are loaded on to the dead lines, shown dotted, and fed at will into the power line, shown in full. From there they are immediately propelled to the process cleaning department, and switched off on to dead lines. Travelling drop sections, such as were shown on the slide of the conveyors serving engine test beds, then take the components off the lines and into the tanks for final cleaning. You will notice that at each side there is storage for spare trolleys. After this cleaning the components are put back into the system by the drop section, and taken to the drip tanks where they are allowed to drain while the conveyor continues doing its other work. Finally when drained, the components are taken

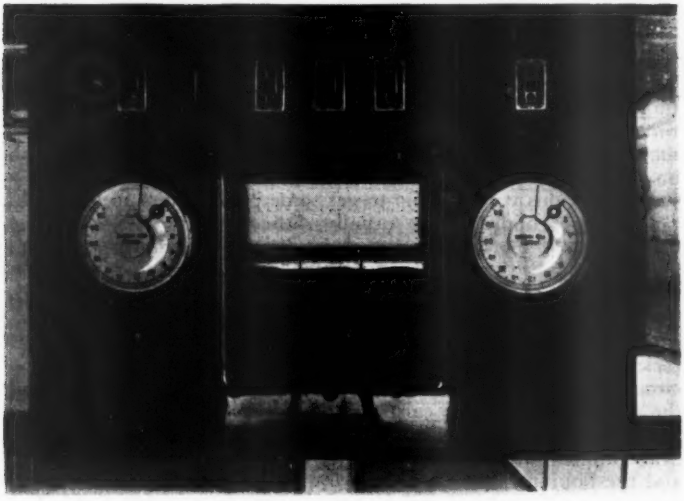
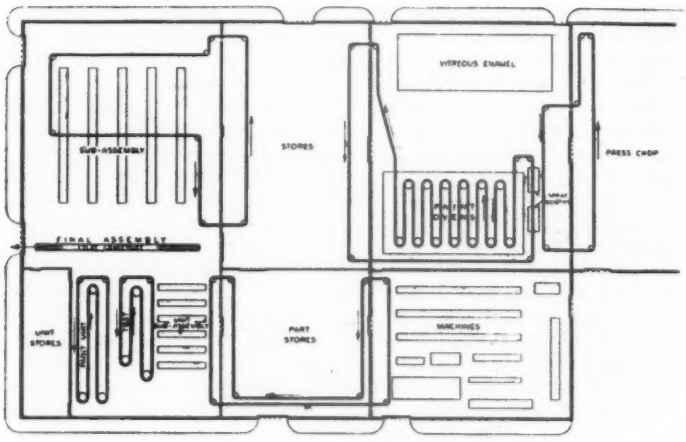


FIG. 28.



TYPICAL CONVEYOR LAYOUT FOR THE MANUFACTURE OF REFRIGERATORS

FIG. 29.

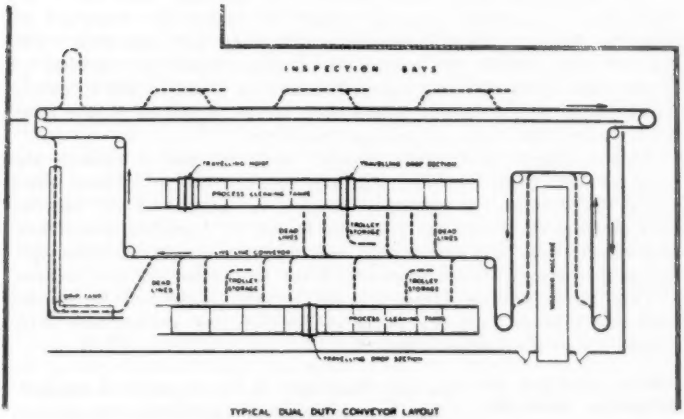
to the inspection bays where the inspectors may spend as long as is necessary on a part without affecting the conveyor system, and then put it back to be taken away for re-assembly.

Here it can clearly be seen that however heavy the articles are they can be conveyed through a factory, soaked for an unlimited time in tanks, taken away to inspection at leisure without being man-handled once, or allowed to hinder the normal flow of work on that same conveyor. You will also see that by installing a system like this it is possible to get some organisation in a department where conditions are usually rather chaotic. The working conditions for the operators can also be greatly improved in this way.

In Fig. 31 is shown a conveyor layout for a cotton spinning mill. Starting at the bottom right, the first conveyor, which is of the overhead monorail chain type, starts in the blowing room where it picks up the laps which have to be taken to the cards. It then circulates all round the card room, distributing laps and collecting the sliver cans from the cards. These cans are taken to the draw frames shown in the centre of the illustration. The cans from the draw frames are distributed by hand among the roving frames, and the bobbins from the roving frames are taken to the spinning frames by an overhead rail conveyor. When a roving frame has been doffed and the machine restarted, the bobbins are loaded by

hand into boxes which are suspended from conveyor trolleys on the dead lines between the machines. When the boxes are full they are pushed into the power line, and the pre-selecting pegs are set for switching off at the correct point in the spinning room. The roving bobbins are subsequently taken by hand and placed on the creels of the spinning frames for use as required. The boxes are then loaded with empty roving bobbins and reinserted in the power line to be taken round the spinning room and to a point where they are transferred to another conveyor, which circulates them round by the roving frames until they are required.

Returning now to the spinning room, you will observe that there are dead lines on both sides of the power lines. Those shown on the right hand sides are for boxes of roving bobbins, but on the others are stored flat tray carriers for boxes of spinning bobbins. When a spinning frame has been doffed the box of bobbins is placed on one of these tray carriers and inserted in the power line. The preselecting peg is set for switching off in the winding section, the yarn stores, or in some cases the weaving section for which the conveyor runs through a tunnel under a road. The boxes of empty spinning bobbins are taken back to the spinning room on the same conveyor and the boxes of cones are also taken from the winding section to the yarn stores and weaving section. Figs. 31 and 32 are perhaps not very interesting to people outside the textile industry, but I wish to show that conveyors can be used fairly extensively outside the motorcar industry.



TYPICAL DUAL DUTY CONVEYOR LAYOUT
IN MOTOR COMPONENT CLEANING WORKS

FIG. 30.

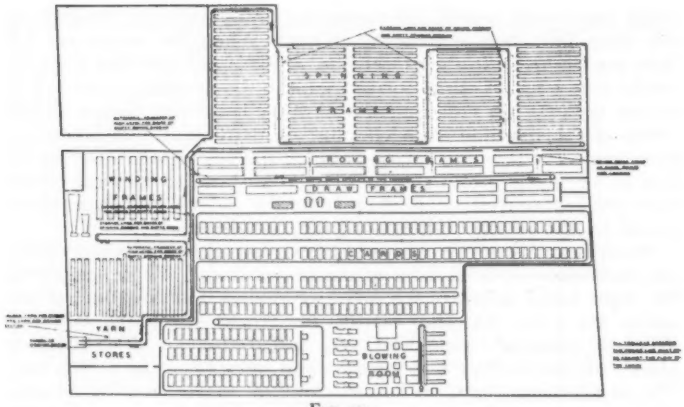


FIG. 31.

Fig. 32 shows a typical layout of a twin rail overhead chain conveyor in a weaving shop. At the top of the photograph is shown a part of the second floor from which the process starts. Here there is a dead line where the weavers beams are picked up from the slashers or sizing machines. These beams on their trolleys are inserted in the power line and taken down to the weaving section on the next floor.

The conveyor passes right round the building and there are dead lines at suitable points at which the beams are switched off near to the particular loom for which they are required. The rolls of cloth which are produced by these looms are loaded on to the same conveyor and taken round to a point in the top right hand corner of the layout where they are switched off to the dead lines serving the cloth inspection machines.

This conveyor also fulfils another duty in that it collects the pirns of weft from the pirn winding section, and circulates them round the looms. It could, of course, be amplified still further by installing drop sections over the looms for handling the beams and cloth rolls, but this would not be very sound economically owing to the long intervals at which the looms require new beams.

This particular building was of a very awkward shape for conveyor layouts, but this is an evil which one encounters fairly frequently in the cotton industry.

OTHER ASPECTS OF MECHANICAL HANDLING Having illustrated a few types and applications I would like to mention one or two other aspects of mechanical handling. In many cases people think there is not much scope for it in their works, owing to the fact that

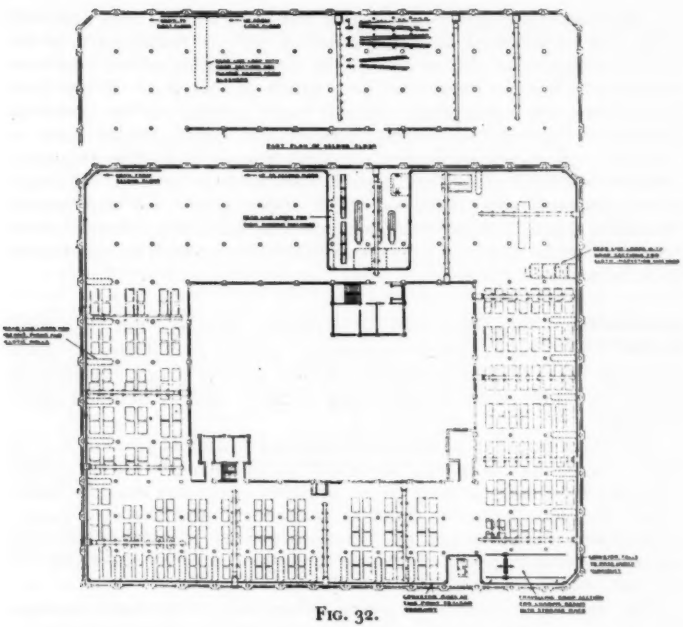


FIG. 32.

there does not seem to be much saving of labour. There are other advantages, however, which must also be taken into account. Every factory has its own particular problems, and it is usually well worth while to make a complete study from every angle to determine these advantages.

Studies of this nature are continually being made, and some very interesting points have come to light. One of the principal savings in many cases has been the reduction in the amount of damage done to the product during the time that it is being transported from one operation to another. A much more accurate control of quantity and quality can be achieved, as a conveyor system will usually show very quickly where bottlenecks and hold-ups occur, and enable those in charge to detect the weak spots in the organisation, and the more rigid control of duration of process ensures that the quality of the product is kept up to standard. The use of mechanical counting, indicating and recording equipment in conjunction with remote control of the variable speed gearboxes on the conveyor drive units has done a good deal to increase efficiency.

The textile industry is one which has been studied very carefully from the mechanical handling point of view in many parts of the world recently, as this is one of the industries in which conveyor equipment has not been used very much in the past. It has been found in some cases that there is more money to be saved by handling mechanically large numbers of light articles such as cheeses and cones from the winding frames than the relatively smaller numbers of heavier articles like weavers beams. It might seem perhaps that there is much more scope for mechanical handling when dealing with such heavy articles, but this is to some extent offset by the very infrequent intervals at which looms require new beams.

ADDITIONAL BENEFITS

The study of this particular problem has, however, raised some interesting points and forms a good example of additional benefits which accrue from mechanical handling, and which do not come to light until a detailed study is made.

The most popular methods of handling beams at present are by floor trucks and overhead monorail runways with lifting tackle. The disadvantages of using trucks are that gangways must be made wider to allow room for them to manoeuvre and there is danger of damage to the looms, as there are usually a number of comparatively fragile parts which are likely to be hit by the trucks or by the beams being carried on them.

The overhead monorail runway is free from these disadvantages but as the usual method is to have one central monorail track over the beam alley to serve two lines of looms, a good deal of physical effort is still needed.

The overhead travelling gantry crane has none of these disadvantages, and as the hoisting equipment can be moved to any point in the shop it can also be used for lifting the cloth rolls out of the looms.

This is a great advantage, in that larger cloth rolls can be handled and the looms need not be stopped so frequently. In some cases it is also found that weavers beams of a larger diameter can be used if mechanical handling equipment is available, and this again means less frequent stops. The proportion of idle time to weaving time is therefore reduced considerably, and the saving thus made probably exceeds by a very large margin the amount saved in actual handling.

Another example may be taken from the textile industry, namely, the transport of cones from the winding shop to the yarn stores and from there to the warpers. It has been found in some cases that a great deal of handling takes place in these departments and a good deal of damage is done to the yarn when the cones are

handled into and out of bins and trucks. By handling them on conveyors it has been found that not only is a good deal of labour saved, but also damage to the yarn is practically abolished, so that the number of stoppages on the warpers due to broken threads is reduced considerably. The tendency nowadays is for warpers to run at higher speeds, so that this point becomes of even greater importance.

All kinds of examples can be taken from many different industries, and to quote a few, mention may be made of the manufacture of refrigerators. The evaporator coils are very difficult things to handle by any means other than overhead conveyors as they are very easily damaged, and as it is usually necessary to carry a fairly large stock a good deal of time and money is often spent on rectification if any other means are used. There are also several manufacturing operations where it is important that a certain process should be spread over a definite period of time, and by doing these operations on a conveyor the human element can be dispensed with to a very large extent. The finished article in its painted and plated casing is also very susceptible to damage, and here again a good deal of rectification work can be saved by the use of conveyors.

TREATMENT OF SPECIAL PROBLEMS

Foundries also present many special problems and there is a good deal of scope for mechanical handling, as the usual working conditions are so arduous and unattractive. By using up-to-date handling equipment it is possible not only to reduce the amount of labour required, but also to make the working conditions more attractive, so that the necessary labour can be obtained more easily. The use of conveyors in tunnels for cooling castings, for instance, can reduce the temperature of a foundry as well as saving floor space. The question of saving damage is perhaps not so vital in foundries except in the case of cores which are, of course, very fragile in the green state. Core conveyors are perhaps the greatest mechanical handling asset in any foundry.

In many cases money can also be saved by using mechanical handling equipment in the stores and warehouse. These departments are quite often overlooked and a careful study of their operation often brings surprising results. It is sometimes astonishing to find the number of times a component is handled before it reaches the actual production departments. It is a very great advantage to have " live " storage so that the components are used in the order in which they are received, and this can easily be achieved by using sloping racks of roller conveyor. These can be made in several tiers with electrically operated stacking machines at each end for loading and unloading. This method reduces the number of

gangways in the stores and enables a larger volume of components to be kept in a given space.

The principal development in recent years in the field of mechanised storage is of course palletisation and the use of fork trucks, but this is a subject on its own which is continually being dealt with by people whose knowledge of the subject is greater than mine.

CONCLUSION In conclusion, I would like to stress these points. If you are considering the application of mechanical handling equipment to an existing layout, be sure that you consider it from every angle. There may be many ways in which you can save money besides simply on reduction of labour.

Remember also that the present layout, although possibly very good under the existing conditions, may not be ideal when using conveyors, and always keep a watchful eye for small modifications which can be advantageous.

The mechanical handling industry has made great strides in recent years, and problems which at one time seemed to be insoluble are now being overcome with ease.

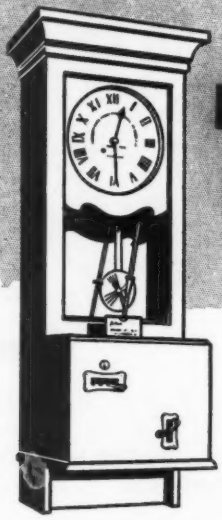
If you are working on a new layout, do not leave the handling side until last. Keep it always to the fore, in every section and through every process. If you are planning a new building, bear in mind the possibility of using mechanical handling equipment when considering the roof loadings. There have been many cases where this point has been overlooked, and very heavy expenditure has had to be met afterwards. There is often a great temptation to save money, and steel, by cutting down on roof steelwork, but this often turns out to be false economy.

The handling of material is a very great, and a very important problem. Always be sure that you give it the attention that it deserves.

(The photographs illustrating this paper are reproduced by courtesy of Geo. W. King, Ltd.).

Notes

Notes



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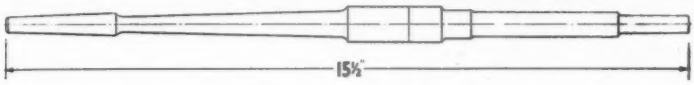

CINCINNATI FILMATIC No. 3 Centreless Grinder, increased in width to accommodate the three-segment grinding wheel in the foreground. A ground part appears in the front of the wheel, and a drawing of the part is shown above.

SEVEN DIAMETERS ON SLENDER 15½" SHAFT

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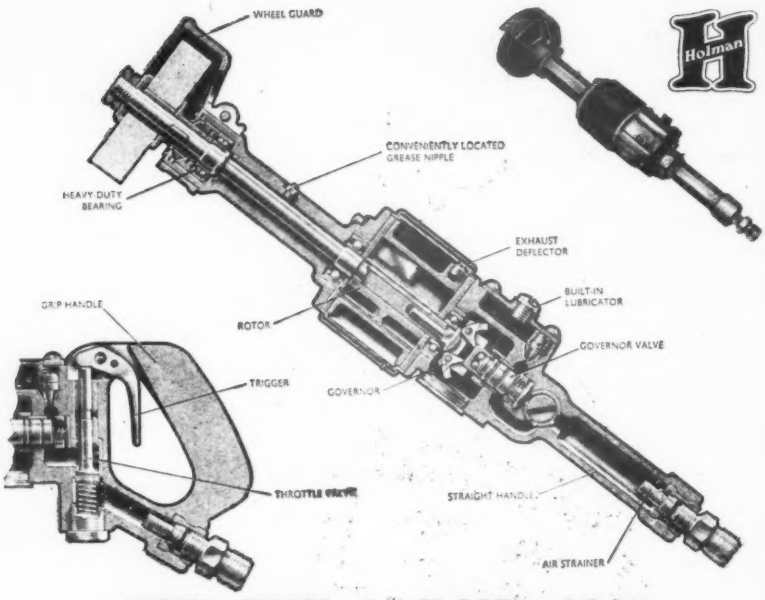

NOW TAKE A CLOSER LOOK

Holman Pneumatic Rotogrinds, as this sectional drawing shows, are simple and sturdy in construction, so that they require no attention beyond weekly lubrication with a grease gun. Their slick efficiency on the job makes them popular with workers in foundries, workshops, shipyards, oil installations and civil engineering projects. Their power/weight ratio is high and their vane-type air motor makes for smooth, quiet running. The range extends from precision grinders to heavy-duty types. "Grip" or "Straight" handles are supplied.

DELIVERY EX. STOCK

SPECIFICATION

Size	Free Speed R.P.M.	Length ins.	Weight lb.
0/1	16,000	12	4
2	8,500	18½	12
4	5,500-6,500	21½	20¾
Loco Rod Type	6,500	29	23¾

Extension Grinders, Surface Grinders, Shank Grinders and Rotosanders are also available.

MEMO *Up-to-date illustrated catalogues of all Holman pneumatic tools, with full specifications, are now ready. May we send you one?*

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H.A.3

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